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Travelling material↔semiotic environments of disability, rehabilitation and physical activity

Abstract

In this article, we apply narrative dialogism and new materialism to health research. We examine how material↔semiotic environments (MSEs) affect the rehabilitation process of Patrick, a man who exercised with the aim to recover from spinal cord injury. The MSEs are considered embedded subcases within the overall holistic case of Patrick. Three MSEs were identified: the hospital gym; the personal gym; and the adapted gym. These are examined using the analytical lens of assemblages. First, the mutually affecting components of each MSEs are described. Second, a larger environmental assemblage is identified, which is termed exercise-is-restitution assemblage. This composite assemblage illuminates the associations between the three MSEs, and reveals how restitution resonated across time and space. The article contributes to the literature by reconceptualising restitution. It highlights the importance of the materiality of health-related narratives, and it reveals the potential of MSE for transforming rehabilitation and improving exercise promotion and maintenance.

Keywords: exercise; gym; spinal cord injury; narrative dialogism; new materialism

Introduction

Exercise is important in the rehabilitation process of people with disabilities due to its associated health benefits. For example, evidence-based knowledge indicates that exercise helps to prevent secondary health conditions and improves the overall health status, well-being and quality of life in this population (Martin Ginis, Jørgensen, & Stapleton, 2012; Smith et al., 2018). On this basis, research has been conducted from different disciplines and philosophies in the hope of informing exercise promotion and maintenance.

Recently, disability and exercise scholars have turned to interpretative forms of research via the use of narrative inquiry, a tradition of qualitative inquiry that focuses on people's stories as they unfold over time. From a narrative perspective, stories constitute a key means by which disabled people¹ know and understand the world, make sense of their experiences and give meaning to their lives. Further, stories have the capacity to *do* things; they can shape what we think, how we behave, and what we imagine as possible, desirable and best avoiding. Therefore, narrative inquiry can offer insights into human lives, including the ways in which stories shape understandings of disability and motivate exercise behaviours (Smith & Sparkes, 2008).

One dimension of interest within narrative inquiry is the narrative environment (Gubrium & Holstein, 2008). This term denotes the physical and socio-cultural environments that support and value specific stories while inhibiting or marginalizing others. From a rehabilitation perspective, research has addressed specific narrative environments such as the gym, the blue gym, the adapted gym or the rehabilitation centre (Caddick, Smith, & Phoenix, 2015; Carless, Peacock, McKenna, & Cooke, 2013; Pérez-Samaniego, López-Cañada & Monforte, 2017; Perrier, Smith, & Latimer-Cheung, 2013; Richardson, Smith, & Papathomas, 2017). This work has revealed useful knowledge for rehabilitation services. Especially pertinent for exercise promotion, it has highlighted that disability narratives act by motivating

and facilitating individuals to access particular exercise environments, or turning them away from these.

However, just like most research on physical activity, exercise and disability –be in qualitative or quantitative– narratively informed work usually considers material environments as a mere backdrop to the human social action or, as Aagaard and Matthiesen (2016) put it, “neutral bearers of meanings, symbols of underlying social mechanisms” (p. 35). That is because narrative inquiry, like many other ways of doing research, lives off a separation of matter and meaning, and focuses on the latter (Barad, 2007).² Given this unilateral focus on linguistic meaning³, a narrative approach alone fails to engage with the material realities of rehabilitation.

Against this backdrop of neglect, we advocate for a broader approach to understanding disability and exercise in which narrative and material orders of existence coalesce. To facilitate this, we offer a specific example of how narrative and materiality were connected as part of our engagements in a case study on rehabilitation environments, exercise and disability.

Assembling narrative and materiality: Material↔semiotic environments

In the last few years, the idea of ontological pluralism has gained considerable attention (Frost & Nolas, 2011). This idea consists of integrating two or more paradigms in a single study, so that each paradigm articulates something that the other misses. Hybrid paradigms are useful for avoiding purism, diversifying understandings of the phenomena under study, and capturing its multi-dimensionality. Attempting to obtain a better understanding of rehabilitation environments, the present article introduces a dualparadigmatic framework that pulls together narrative dialogism and new materialism.

Narrative dialogism (ND) addresses the ways in which personal and cultural realities are constructed, enabled, and constrained in relation to other people through dialogues. This perspective understands people as inherently relational beings, and storytelling as part of a dialogue between two or more voices. As Frank (2005) put it, following the dialogical thoughts

of Mikhail Bakhtin, “no one person’s voice is ever even his or her *own*; no one existence is ever clearly bounded. Instead, each voice is always permeated with the voices of others” (p. 968). The primary concerns of ND can be synthesized in the question: How does a storyteller represents life in the form of a story, and which multiple voices can be heard in his or her voice? (Frank, 2012).

New materialism (NM) refers to a range of theoretical perspectives that emphasize the materiality of the world and everything within it. This approach abandons the poststructuralist focus upon language, but retains its potential to avoid simplistic essentialist ideas of the human body, which accept impairment as a brute fact (Feely, 2016). Core tenets of NM include an emphasis on ontology over epistemology; a monist ontological stance that challenges natural/cultural, human/non-human and -perhaps most significantly for this article- human/environment dichotomies; an interest on events, rather than structures or systemic explanations; a rejection of the philosophy of representation; and an understanding of agency that no longer privileges human action (see Fox & Alldred, 2018a).

In this article, we view new materialism as a creative extension of narrative dialogism. We suggest reading our combined account as a polyphonic form of philosophy (Bakhtin, 1984): an assemblage of forms of thinking. Although the ontologies of each paradigm differ fundamentally, this does not mean that they cannot productively supplement each another. We believe that an alliance between the arguments and aspirations of dialogical and new materialist thinkers (rather than their particular onto-epistemological stances) can help us give a materially sensitive attention to narrative, and see matter as a “site of narrativity” (Iovino & Oppermann, p.451). To perform this amalgamation coherently, however, several adjustments and expansions to these two approaches are required.

First, an adjustment to Bakhtin’s conception of voice is needed, given that it privileges the speaking subject and their stories at the expense of matter. NM take a critical stance towards

such ‘anthropocentric’ and ‘logocentric’ focus and proposes thinking through a more-than-human orientation (Kuby, 2017; Fullagar, 2017). This way, Mazzei (2013) introduces the notion of ‘Voice without Organs’ in which voice is decoupled from its humanist subject and invoked as part of the ‘assemblage ... of human and nonhuman agents that exceeds the traditional notion of the individual’ (p. 734). Under this modified conception of voice, any claim that “dialogue can be only created between people” (Smith et al., 2009, p. 344) is challenged. One does not have to be a human being in order to dialogue because agency is understood not as consciously exerting one’s will, but rather as making some difference to a state of affairs (Latour, 2005). Thus, dialogue still matters, albeit in a renewed, posthumanist sense.

Second, the coupling of ND with that of NM rejects asking essentialist questions and focuses instead on what Gilles Deleuze terms actual and virtual capacities (Feely, 2016). The implication of this emphasis is that bodies, things and stories are to be studied not in terms of what they are, but in terms of their capacities to act and affect—the things they can and cannot do as actors in relation to other actors. As stated by Law and Mol (2008), an actor is any entity that makes a traceable difference to the other entities with which it is connected. As such, actors’ capacities for doing and becoming are relational and contextual. What can stories, bodies and things presently do, and what could they potentially do in a different context? What context-dependent capacities enable stories and matter to do what they do? Such questions lead us to map plausible realities, which are assumed to be mangles of materiality, inclusive of both human and nonhuman actors (Gildersleeve, 2018).

Third, and related to the above points, a common belief of ND and NM is that reality is a constant process of becoming, and thus research should not finalize when presenting its outcomes. In ND, to finalize means saying the last word about who a person is, and who he or she would become. This deterministic practice would finish the dialogue, as dialogue “depends

on perpetual openness to the other's capacity to *become someone other* than whoever she or he already is" (Frank, 2005, p.967, original emphasis). Given that NM also understands matter as agentic and always changing, it too lets us consider matter's capacity to become someone other through dialogue. Then, for example, when talking about the human body, we talk about a perpetually becoming-body in a dynamic relationship with its material environment. Such understanding avoids essentialism by affirming that all bodies differ from each other and are in a process of constant change and becoming, always differing from its younger self (Feely, 2016).

Fourth, in the seminal reference for ND Frank (2010) drew inspiration from Donna Haraway and John Law –the precursors of material-semiotic versions of NM– to articulate a dialogical account. Engaging with their ideas, Frank recognized that objects and stories live in the same ontological plane, and rendered stories as “material-semiotic companions”. For him, the material dimension creates and shapes the semiotic dimension, and vice versa:

Stories are made up of signs –their semiotic being– and they are material not only as they do things... but also in their capacity to take material forms (...). Stories capacity for symbiosis becomes literal shape-shifting: stories not only work with objects; stories take the form of objects, which are known as materialized stories (p. 43).

Despite retaining the emphasis on stories and dialogue, Frank's view undoes the materiality/narrative binary, and retains the two elements without privileging either. This entanglement of the material and the semiotic in the stories implies that “materiality matters not as an add-on to language, not as a matter of language, but because the material can never be separate from language” (Fullagar, 2017, p. 253). To make this explicit, Kuby (2017) wrote material↔semiotic with a double arrow, pointing out the mutually constitutive nature of things and stories. One is not more important than the other, nor comes before the other; neither can be articulated in the absence of the other.

Finally, both ND and NM avoid using rigid methods that prescribe a set of predetermined and linear instructions to follow. Instead, ND and NM open up fluid methodological spaces in which “methods and research approaches melt, transform, circumvent, infiltrate, appear and disappear” (Koro-Ljungberg, p. 86). According to Rabinow and Rose (2003), travelling the fluid space between ND and NM “would be a movement of thought that invents, makes use of, and modifies conceptual tools as they are set into a relation with specific practices and problems that they themselves help to form in new ways” (p. xv). Thus, research from our integrative research paradigm would begin with a concept instead of a preexisting method to follow. Concepts operate as experimental tools that create orientations for thinking and (re)orient research practices. It is in that way that concepts or ‘acts of thought’ operate themselves as methods drawn from the problem at hand (Lenz Taguchi & St. Pierre, 2017).

Emerging from the assemblage of ND and NM described above, this article develops the analytical notion of ‘material↔semiotic environment’ (MSE). This concept reflects the productive tension between those paradigms and the practices and problems of our research project, of which we give details later. The basic theoretical premise for the creation of this concept is that bodies and stories cannot be isolated from the environments and objects to which they relate. That is, environment is not separate from humans, but part of the human experience (Fox & Alldred, 2016; Srnicek, 2007). Given this ‘flat ontology’, there is no subject and no object in a MSE, in the same way that no single element within a MSE possesses agency, since agency is relational and horizontally distributed. Therefore, matter draws its agentic power from its relation to dialogues and narratives that, at the same time, configure human relations to materiality.

Goals and procedure

The project on which this article is based sets out to examine the case of Patrick, a man living

with chordoma since 2008. Chordoma is a poor prognostic cancer diagnosed in one in one million people per year. About half of all chordomas form in the sacrum, 30% form in the skull base, and 20% form in the bones of the mobile spine (Stacchiotti & Sommer, 2015). Patrick's chordoma was located in the thoracic spine. Due to the location of the tumour, chordoma can result in spinal cord injury (SCI). Furthermore, it is usually not possible to achieve a wide resection of the tumour without causing serious side effects, including damage to the nervous system. Despite this, surgery is recommended as the main treatment for chordoma. Patrick's spinal tumour was first surgically intervened in January 2009. His spine was damaged, and two vertebrae had to be removed, being replaced with metal implants. Throughout the years, he underwent surgery on 6 occasions due to tumorous recurrence, which aggravated the SCI. Additional inorganic materials had to be implanted to protect and stabilise vertebrae. A palliative surgery was performed in February 2013. The last clinical report to which we had access, dated April 2016, indicates a grade D in the ASIA impairment scale (AIS).

Given the disruptive influence of SCI onset and progression, Patrick was faced with having to re-map his life, and make the changes that had occurred intelligible. One way this happened was through storytelling. Patrick's storytelling experience was addressed in the first study of our project (Monforte, Pérez-Samaniego & Devís-Devís, 2018). Our dialogical narrative analysis revealed how a war book provided him with an allegorical narrative map of how to live with SCI and survive cancer. This analysis helped us to understand Patrick's process of rehabilitation and the significance of the role exercise played out across time. However, it overlooked materiality. Owing to our 'habits of seeing' and our 'anthropocentric gaze' (Hultman & Taguchi, 2010), we saw Patrick as independent and detached from its environment and put him and his stories above other matter involved in the case. More recently, as newcomers to NM (Monforte, 2018), we started to see that as problematic and sought to incorporate the materiality of exercise-based rehabilitation in our project.

Patrick took exercise intermittently throughout six years, until he eventually dropped out in 2016. Especially relevant for this article, Patrick exercised in three different MSEs. He called them *the hospital gym*, *the personal gym*, and *the adapted gym*. In visualizing our project as a whole, we view these environments as embedded subcases within the overall holistic case (Yin, 2012). Hence, the case of study in the present article is not Patrick nor his stories, but the three MSE in which he used to do exercise. The purpose of this study is to examine 1) how these MSE shaped Patrick's rehabilitation process, and 2) how a kind of exercise engagement and participation emerged as the concretization of material and semiotic dynamics.

Prior to data collection, the research obtained the approval of the Ethics Committee of Research on Humans from the University of València. Written consent was taken from Patrick from the beginning of the project, although informed consent to use data over time and within different academic contexts –including this article– has been ongoing. At the onset, data was obtained integrating different data collection techniques, resulting in a rich and eclectic data set. Life-history interviews, object interviews and participant-produced images in different formats (internet images, collage, photographs) were utilized.⁴ Moreover, Javier spent four months working as a volunteer in the adapted gym, where he first met Patrick. He also conducted participant observation in further environments, including Patrick's house and the hospital in which he has been treated since diagnosis. The oscillation between interviews and participant observation was deemed a proper approach for it enables the researcher to have “an ear for meaning and an eye for materiality” (Aagaard & Matthiesen, p. 41). However, Patrick's health state worsened, which altered the course of the research. This scenario demanded an ethical and procedural shift (Morse, 2007).

In dialogue with Patrick, it was resolved that conducting additional formal interviews was not appropriate. Javier reduced the visits in-person to minimize interference. This, however, did not signify the end of the research, but rather a search for less intrusive ways of

interaction. At this stage, it was emphasized to Patrick that he could decide over his involvement and abandon the research at any stage. Following further conversations, Javier and Patrick agreed to engage in informal interviews via telephone and WhatsApp that would serve to sustain a supportive relationship *and* to keep collecting data in a sustainable way.

According to Mealer and Jones (2014), telephone interviews are a valuable method of gathering information on sensitive topics. In this study, telephone interviews extended access to Patrick, and enhanced the rapport and trust that was built previously in person. In addition, they offered greater flexibility for re-scheduling, and gave Patrick greater control over the conversations. Instant messaging provided Patrick with a comfortable and friendly way to communicate that did not impacted too greatly on his time and fitted around everyday's life. This was especially important, since he frequently spent days resting on the bed due to fatigue or intense physical pain. In order to ensure a non-hierarchical relationship between the researcher and the participant, Javier was involved in a reciprocal sharing of his personal stories. Given the sincere rapport built throughout the research, Patrick started to contact Javier by own initiative to share new stories, images and personal thoughts. This continued happening on a weekly basis during almost two years. Reflective field-notes were used to document the evolving nature of research and personal thoughts of the dilemmas and challenges that Javier had along the way. Likewise, Víctor and Brett became involved in the project as supportive but 'critical friends' that acted as both an ethical and a conceptual sounding board to encourage further thinking in relation to the data and writing.

The concept of MSE was both the object of analysis and the activating methodological force for the inquiry. The analysis involved thinking about MSE in terms of assemblages, and then thinking how these assemblages shaped what was at stake for Patrick in different MSE. Deleuze and Guattari (1987) described assemblages as networks of heterogeneous elements that come together temporarily and work as a whole to produce something. In disability studies,

Feely (2016) offered an accessible account of this conceptual tool. Drawing on this author, the perspective that assemblage brings to analyzing MSE can be summarized in three interrelated points.

First, assemblages should not be understood as seamless totalities or closed systems. Any assemblage is made up of smaller assemblages and is part of larger ones. Second, assemblages can have relationships of interiority (between component parts) and potential for relationships of exteriority (with other assemblages). Finally, it is always possible to remove a component from one assemblage and plug it into another. Therefore, assemblages are fluid and continually in flux, as relations join or leave. They are constantly moving and becoming. Deleuze and Guattari (1987) call these movements flows, and suggested that an assemblage “necessarily acts on semiotic flows, material flows, and social flows simultaneously” (p. 25).

Consistent with these conceptual underpinnings, data were treated not as means to obtain subjective, transparent representations of Patrick’s life, but as means to explore how he was situated within particular environmental assemblages. In analysing data, we did not establish one element (such as narrative) as transcendent and determinant, and follow (in a linear fashion) how it shaped or created the other elements. Rather, we saw the components of the MSE as distributed symmetrically and mutually affecting (Feely, 2016). This means that all the actors in a MSE (stories, machines, human beings, buildings etc.) are part of the same assemblage, and that any of them should be privileged. With these analytical issues in mind, we now move to present the findings of the study regarding the three MSE in which Patrick used to do exercise, and the larger environmental assemblage that these conformed.

Results

The hospital gym

The hospital gym was a rehabilitation setting within a public hospital that offered recovery-centric types of exercise. These served as a way to maximise physiological and neurological capacity, and to restore the newly impaired body close to its former, pre-injured state. Whilst other environments at the hospital, such as the examination room, prescribe medical science, the hospital gym prescribes exercise as the chief means by which a person can recover from SCI.

Patrick described the hospital gym as containing the “basic machinery” such as “parallel bars, to be able to walk again”, and “cages to put tackles that were used to start moving the muscles that I had lost” (Fig. 1). He said:

The equipment we had there got my hopes up because... having an incomplete injury, it was necessary for me. For example, the parallel bars ... were necessary to reinforce or remind all my nerves and my leg muscles that I needed those parallel bars to hold on to them, man, to not fall to the ground. And that was a lifesaver that I got. I laid on them with my arms, and at the same time they made my legs work again. Parallel bars for me, both them and the wall bars [Fig.2], which made my quadriceps work out, for example, because I got up from my wheelchair, grabbing the wall bars with my hands for the quadriceps to work, doing squats, for example. For me those were essential devices, man, because I was truly strong in my upper body, and they prevented me from falling to the ground. Somehow, those devices in the gym made me feel safe, because they made me feel that I was not going to fall to the ground; and at the same time those devices heartened me, ‘cause I thought I was doing the exercises correctly and I was strengthening the muscularity I had lost during the hospitalization time.

INSERT FIGURES 1 AND 2 HERE

The attendance of doctors on a daily basis was also a key component of this MSE. “They come down to take an interest in how people are doing and so and forth. Well, they talk to you and, fuck, somehow they empower you, man. Somehow they are encouraging you to carry on”. Patrick viewed doctors as an authority to follow. As he put it: “the doctors were my generals” (Monforte, Pérez-Samaniego & Devís-Devís, 2018). On the one hand, medical authority was shaped through symbolic interactions and historically constructed positions that were worked out during those interaction. On the other hand, it was actively produced and sustained by the *material presence* and practices of the doctors. This is consistent with Aagard and Matthiesen (2016), who stated that authority is not only produced through narrative, but also through material objects and embodied being.

As consistent with previous research (Hammell, 2007; Williams, Smith, & Papathomas, 2014), sharing the environment with peers provided a sense of realization about what could be achieved with SCI, as well as the opportunity for incidental learning to occur from people with similar impairments. Patrick rendered the hospital gym as an “encounter point” with peers and, related, with information that allowed to “connecting with what was happening to us”. In this MSE, Patrick simultaneously found a collective story (an ‘us’) to which subscribe (Richardson, 1990), and other stories that floated in the river of not-for-him (Frank, 2010).

The boundary between the stories to think with and those best avoiding was a matter of motivational differences or horizons of understanding, as dialogical theory suggests (Smith et al., 2009). However, it also was matter of the material limitations and possibilities of living with either complete or incomplete SCI.

There were people with incomplete injuries, and they already know that, unfortunately, they will never get back into walking again. So they were realistic in some way and they were not even looking forward to walking again. But there were some other peers who had an incomplete injury and, well, somehow they still had the eagerness of walking again.

The ‘incomplete injury’ of his peers moved Patrick to focus on restoration via exercise. Importantly, it was their actual SCI –that is, the materiality of their bodies– what counted for Patrick to emplot his own injury and to think about the virtual capacities of his body. When we view the human body as an assemblage, Patrick’s spine is entangled with other spines. The SCI of other bodies plug into Patrick’s own body, indicating the direction that his rehabilitation journey could, and should, take.

The personal gym

Patrick talked about the ‘personal gym’ to refer to a small room attached to the dining room of his detached house. Patrick himself transformed the room into a gym; he purchased exercise machines and reorganized the space to fit everything. In an object interview conducted in his house, Patrick showed and described one by one all of these machines, including a Smith machine (Fig. 3) and two bars attached to the wall), through which he “stood up from the chair and work my quadriceps and calf muscles”. Patrick said that he had all what he needed in the room, except parallel bars, which for him were “fundamental”. In the absence of them, he used a walker. “That (Fig. 4) was the second walker I had, ‘cause I burst the first one by walking so much”.

INSERT FIGURES 3 AND 4 HERE

The material properties of the room influenced Patrick’s orientation to exercise. For instance, the room’s door help Patrick to isolate himself in its own exercise performance⁵: “I used to close the door and isolate myself. Note that my injury was incomplete and that in some way I was pretty autonomous”. Meanwhile, a music amplifier helped Patrick to put the world behind him when working out:

I bought that amplifier there below to put the music on and, you know, disconnect from the planet, man. I focused only on music and exercise, all the rest didn't matter to me (...) music channelled, let's say... well, the pain that I could have, or the suffering, because when you have a spinal cord injury, just standing produces a neuropathic pain in your legs, or produces discomfort.

INSERT FIGURE 5 HERE

Besides illustrating how the music amplifier assisted him in leading a secluded exercise routine, Patrick's comment also points out the key role of music in dissociating him from pain. Simply put, the music amplifier amplified his capacity to "fight the pain". A further component of the MSE that helped Patrick in this "fight" was the air conditioner: "here [at the room] in winter... and I, given the operations and the injury... the cold affects me a lot. I needed heating to exercise". When Patrick started exercising in the room, pain was more acute: "I started doing maybe five push-ups, you know? And those little push-ups that I started doing caused me a lot of pain during the first months". As time passed, Patrick learned how to adapt his body practices to decrease pain levels. For instance, he used a static bike (Fig. 6) for 5-10 minutes at the beginning of every session "to warm up the muscles of my legs, so that the exercises I was going to do with them would not hurt much". Due to his discipline and constancy, Patrick improved fitness that permitted him to increase the intensity and repetitions of the rehab exercises. He perceived this as a sign of progress and recuperation.

INSERT FIGURE 6 HERE

The adapted gym

The adapted gym (Fig. 7) was a space dedicated to the improvement of physical fitness in a controlled space with adapted equipment, health and safety legislations and qualified practitioners. That gym was thought for and by people with disabilities, and followed a person-centred approach (Gzil et al., 2007) whereby users' self-determined motivation in setting their own goals was respected. Within the same building, the gym shared space with rooms of occupational therapy, speech therapy, physiotherapy, as well as a hair salon and a bar. Sandwiched between those facilities and the gym stood a spacious corridor to march with a walker, or go by tricycle or handbike. Despite not having sophisticated machinery, the design of the environment and the adaptations in the equipment offered multiple benefits for users with different performance levels. For instance, what Sparkes, Brighton and Inkle (2018) called low-level and less obvious cyborg technology, like velcros and rubber bands, helped to increase, maintain or improve user's capacities for activity and participation, or reduce task demand. Among all the devices available in the adapted gym, Patrick highlighted a transitional standing and walking frame⁶ that allowed him to get around the corridor of the gym.

At the adapted gym, I was able to walk twice or three times around... with the walking frame, of course. Very carefully, slowly. Maybe you remember that, going round the corridors of the gym. Therefore, man, I realised again that I was walking again.

In Deleuzian terminology, the walking frame shaped the virtual capacities of Patrick's body, as well as the emplotment of its possible becomings. Just as narratives enable imagination, the frame allowed Patrick to imagine himself regaining the capacity to walk again in the future. That is, to become what he used to be, which is able-bodied. This promise of strengthening and maintaining the body for a functional recovery helped maintain Patrick's motivation for exercise participation.

Alongside this, the materiality of the adapted gym also offered great possibilities to make new friends and interact with peers. A case in point is that the disposition of the handbikes anchored to a large table (Fig. 8) enabled and encouraged positive social interactions. The proximity between each handbike invited to chat with the person in front and aside. In this sense, the gym was a socializing space, in contrast with the personal gym, where Patrick was secluded.

INSERT FIGURES 7 AND 8 HERE

The exercise-is-restitution assemblage

The material-semiotic actors and situated practices involved in the three environments in which Patrick did exercise were collectively responsible for, and collaboratively supporting the use of *exercise as a form of restitution*. Frank (2013) referred to restitution as a narrative template adopted by many of ill and disabled people throughout the Western culture. Restitution involves the goal of recovering from SCI, and hold the basic developmental storyline ‘Yesterday I was able-bodied, today I’m disabled, but tomorrow I’ll be able-bodied again.’ (Smith & Sparkes, 2005, p. 1096). This emplotment called upon Patrick to be motivated to exercise to walk again.

The *voice* of restitution echoed in the three MSE in which Patrick exercised, and assembled them. Altogether, they constitute a composite assemblage: *the exercise-is-restitution assemblage*. This assemblage, which we discuss below, exposes the dialogical capacity of voices to join in a whole, without each sacrificing its distinctiveness (Frank, 2010). Furthermore, it serves as an example of how voice is productively bound to an “agentic assemblage” (Mazzei & Jackson, 2018). With this in mind, *the exercise-is-restitution*

assemblage helps us to trace the dialogue between each MSE to find out how they co-produced restitution and materialised past, present and future.

The dialogue between assemblages is produced through flows of affect.⁷ Deleuze called “affect” to something that affects or is affected. Affects are forces that connect matter to other matter relationally within assemblages, and produce the capacities of the assembled relations. For instance, Fox and Alldred (2018b) think of memory as a key affective element that might connect different MSE existing on different temporal and spatial scales. For them, “it is partly the memories that individuals bring to events that link these events across time and space, in the process producing both social continuities and change” (p. 6). Despite that past experiences in a MSE are not materially present within current MSE, memories of past experiences had a virtual presence via reminiscences of earlier events, along with other virtual affects such as expectations, imaginations and fantasies. A series of actions, gestures, and ways of relating to others within the adapted gym reminded Patrick of the hospital gym. This resonance with his prior experiences might be one reason why Patrick was drawn to the adapted gym as a MSE for engaging in exercise. Notwithstanding, as Frank (2010) argued, stories remain resonant even when they are not consciously remembered. They continue performing; they continue vibrating, just as strings or parts of strings in a guitar might resonate when other strings are sounded (i.e., string resonance).

Mirroring Bennett’s (2010) notion of “vibrant matter”, here we understand resonance as the prolongation of a story by the vibration of matter. That is, stories resonate because environments resemble and reassemble past events. In viewing resonance as something materially produced in a MSE, and as an entanglement of past and present matter in an assemblage, we also echo Barad (2007), who inspires an understanding of stories as “actual physical arrangements” that dialogue with other matter. Simply put, as things entangled with other things. Stories are “not apart from, but a part of, matter” (Kumm & Berbary, p.74).

The above considerations can be understood empirically with an example from the case study. The restitution stories which Patrick dialogued with at the hospital gym acquired a universal significance and coherence within the *exercise-is-restitution* assemblage. As Frank (2010) explained, new stories echo the older stories, with those echoes affecting the present story. Echoes of past encounters with human (e.g. peers, doctors) and non-human (e.g. walker, parallel bars) actors at the hospital gym were materialized in concrete objects at the adapted gym. For instance, the walking frame gave the restitution story a tangible presence across MSE. Then, in the exercise event of walking-with-the-walker, restitution resonated. Stories that matter *travelled* from one MSE to another, producing the capacities for Patrick to continue becoming-with-restitution.

Deleuze and Guattari (1987) discuss how assemblages both enable and constrain flows, allowing affects to travel in certain directions and not others. In the case of study, flows of affect worked towards the territorialization of the *exercise-is-restitution* assemblage, increasing its internal stability. “Territorialization” is a process of specification that tends to shift bodies into habit and repetition. Relatedly, “reterritorialization” refers to the ways in which continuity, sameness and boundaries are maintained within an assemblage (Feely, 2016; Fox & Alldred, 2018b). These processes are evident in the *exercise-is-restitution* assemblage. In the same way, we can appreciate how affects travelling from the hospital gym and the personal gym seemed to shape the potentialities of the adapted gym. This limits new possibilities for Patrick to become differently through exercise, that is, to depart from the territory of restitution (i.e. deterritorialization). In particular, we are thinking of the broad range of exercise opportunities beyond recovery-centred exercise, which may be psychosocially fulfilling and supportive of exercise maintenance over time. While the three MSEs enabled *exercise-is-restitution*, they restricted or stifled other ways of understanding and enacting exercise, such as exercise as a form of progressive redemption (i.e. growth in adversity) (Papathomas, Williams, & Smith,

2015).

While this article illustrates some of the currently realized or *actual* capacities of the three MSE, we are left wondering about their possible but not realized *virtual* capacities. For example, if Patrick had access to other practices and encounters within any of the three MSEs, he might have continued exercise engagement with the goal of enjoyment or social interaction. What other possible, but not realized virtual capacities could the MSE have been brought to light? Likewise, we ask ourselves how other MSE might have worked in shaping Patrick's rehabilitation process, enabling and disabling different processes of becoming. Answers to these questions are beyond the scope of this article and will be dealt with in our future work.

Conclusion and directions

In this study, we explored how different environments operated as active agencies to co-produce a type of exercise participation shaped by restitution. In light of the results, the present article extends exercise and health science literature by revealing that restitution is far more than a narrative template. While restitution has been defined and considered as a narrative, we argue that it takes place on a 'two-way track' –to borrow a phrase from Dolphijn and van der Tuin (2012, p.110). This means that restitution is a material-semiotic phenomenon that takes place in environmental assemblages, or what we have termed MSE. As illuminated in the analysis, restitution is no longer a story of Patrick, or of his experience, but an assemblage of material and semiotic forces. This new (and potentially richer) way of thinking about restitution cuts through narrative/materiality dualism, and points out that material forces are equally at play in constituting people's process of becoming-with-restitution.

Up to now, restitution narrative has been a prominent knowledge tool in the research agenda of disability and rehabilitation. Several studies in this field highlighted that restitution narrative is key to understand disabled people's health behaviour, identities, exercise motivation, and body-self relationships, which has essential implications for future theory-

driven interventions (e.g., Sparkes, 1998; Smith & Sparkes, 2005; Perrier, Smith, & Latimer-Cheung, 2013; Monforte, Pérez-Samaniego & Devís-Devís, 2018; Papathomas, Williams, & Smith, 2015; Williams, Smith, & Papathomas, 2014). While we find that lessons learned about restitution extremely valuable, the traditional focus on narrative territorializes the concept, and narrows its capacities. In contrast, deterritorializing restitution expands and reshapes the potentialities of such concept, opening up possibilities for aggregate conceptual relations and obtaining new knowledge. We call on other disability and exercise science scholars to consider how their ‘tried and trusted’ ideas, like self-determination theory, might benefit from deterritorializing.

Besides addressing the virtual potentialities of restitution, this study opens extensive venues for understanding exercise engagement, as well as for promoting alternative ways of thinking about rehabilitation through a more-than-human lens. In particular, we have put in conversation two paradigms that, in tandem, show great potential for examining how environments –as agentic assemblages– have important consequences for the ways in which disabled people live and tell their rehabilitation process. Likewise, we have developed the idea of MSE both as a matter of inquiry and as a conceptual tool. Although we have applied this idea in our empirical research, we are also curious about its creative capacities in rehabilitation and exercise sciences, as well as its possibilities in related areas of research. At least, MSE acts as a sensitizing idea that can orientate us toward relevant aspects of rehabilitation. Thinking with MSE might help us to imagine rehabilitation and exercise differently, and to experiment with the human and non-human resources at hand to improve exercise experience in rehabilitation.

With regard to practical opportunities, disabled people may be more likely to sustain and enrich participation if practitioners (e.g., physiotherapists, disability support staff) are able to enhance the evocative capacities of the MSE in which they work, that is to say, its capacities

to resonate stories and embodied practices that *matter* over time. Through spatial experimentation and storytelling, rehabilitation workers and other health professionals are in a position to help create, maintain or facilitate enabling MSE, which open up new associations, practices, and becomings (Gibson, King, Teachman, Mistry, & Hamdani, 2017). For instance, professionals can narratively *and materially* ‘ambush’ people in rehabilitation environments by optimizing the material-semiotic resources they have access to, thereby expanding the number of agents that are allowed to act for them in positive ways (Smith, 2013).

Taking into account the agentic character of objects and locations in rehabilitation, professionals can furthermore experiment by intervene in the physical relationships between objects and bodies. For example, they can purposively alter the material qualities of facilities and equipment, as well as change its position and its orientation within a particular space. This will affect user’s participation in unexpected ways, some of which might disrupt health-related behaviours, and promote new, more positive ones. This strategy can associate with the telling of counterstories, i.e., the stories that offer resistance to dominant narratives (Phoenix & Smith, 2011). Effective counterstories perform themselves into the material world, and might challenge the often-unrealistic opportunities that restitution offers regarding exercise participation. Attempts of deterritorialisation in this direction represent fruitful avenues for future practice and investigation.

Given the possibilities of qualitative research to be generalizable in, for example, naturalistic, transferable, analytical or intersectional ways (Carminati, 2018; Smith, 2018), further research is necessary to evaluate the generalizability of our findings and to illuminate how SCI –and other impairments– are enacted across different MSE, including hospitals, conventional, adapted and blue gyms, parks, private houses, and any other exercise setting where adjustment to an injury may take place. Moreover, due attention should be given to how disability narratives that motivate specific types of exercise participation are entangled with

other motivation technologies such as equipment, machines and assistive technologies of mobility. Equally, given that Patrick largely conformed to restitution, researchers may wish to explore the materiality of other disability narratives, such as quest, chaos, or emergent (see Frank, 2013; Smith, 2013). Throughout such investigations, we suggest engaging with paradigms, theories and concepts that allow accounting for the material and the semiotic dimensions of disability, rehabilitation and physical activity altogether.

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1. Like Gibson et al. (2017), we use the term ‘disabled people’ as opposed to ‘people with disabilities’ to emphasise that persons are disabled by sociomaterial barriers in the environment, and not solely by their bodily impairments. This position still retains a reductive environment/person distinction that we critically discuss in the article, in line with these authors.
 2. Opening a discussion on the “dematerialization” of the world into linguistic and social constructions, Barad (2007) alleged that language has been granted too much power. The linguistic turn, the semiotic turn, the interpretative turn, the cultural turn: it seems that at every turn lately every “thing”—even materiality— is turned into a matter of language or some other form of cultural representation. . . Language matters. Discourse matters. Culture matters. There is an important sense in which the only thing that doesn’t seem to matter anymore is matter (p.132).
 3. The hegemonic status of language has been named pantextualism, linguistic idealism, or semiotic reductionism.
 4. Life-story interviews are qualitative research methods that provide a space for the participants to tell the story of their life in the way that they choose to tell it. Photo-interviews and object interviews utilise visual material or material objects in an interview setting to stimulate storytelling. See Atkinson (1998), Glegg (2018) and Chamberlain and Lyons (2016) to learn about what these forms of interviewing are, which benefits and uses they have, and the key practical stages and ethical assurances involved in each.
 5. It is noteworthy that, in the previous dialogical analysis of Patrick’s narrative mapping, we found that his body was monadic in its other-relatedness, and dissociated in its self-relatedness (Monforte, Pérez-Samaniego & Devís-Devís, 2018).

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6. This walking frame looked like those that can be found at the website:

<https://www.secondstepinc.com/>

7. The ontological turn and more specifically NM has recalibrated a number of concepts such as ‘agency’, ‘difference’, or ‘affects’. This ‘new’ vocabulary can lead to confusions, so it is important to elucidate how a concept is different (Monforte, 2018). From a posthumanist framework, the notion of ‘affect’ is distinguished from ‘emotion’. Affects are not just feelings or emotions but forces influencing a body’s modes of existence. See Zembylas (2017) for a concise explanation of the distinction between affect and emotion.